(6.) Jabez Hogg Esq
With R. V. Tuson's Kind regards

DEATH OF SEVERAL HORSES

FROM

FEEDING ON OATS AFFECTED WITH FUNGI.

By ASSISTANT-PROFESSOR VARNELL.

Reprinted from 'The Veterinarian' of February, 1862.

The following interesting particulars relating to the death of several horses from partaking of some deleterious oats were recently forwarded to me by Mr. Mitchell, M.R.C.V.S., Leeds. In his first letter dated August 27th, 1861, Mr. Mitchell writes as follows—

> Dear Sir,—A gentleman in this locality, has lost six horses in a very sudden manner. The veterinary surgeons engaged, viz., Messrs. Dray, Cuthbert, and myself, are unanimous in our opinion, that poison, in some form or other, is the cause of death, notwithstanding that the contents of their stomachs and intestines have been analysed by different chemists. No trace of poison, it is said, can be found. The oats, beans, &c., have also been subjected to a like analysis, and with the same result. We feel pretty sure that the cause of death is connected with the oats, *three feeds* of which, given to a horse obtained for experiment, were found sufficient to produce death. Should you be able to afford us any assistance in investigating this case, you would confer at least a great obligation upon myself. A history of the cases, with the *post-mortem* appearances, shall be sent you forthwith.
>
> I am, dear sir, &c.,
> (Signed) John Mitchell.

In reply, I informed Mr. Mitchell of my readiness to give him every assistance in my power, and requested to be furnished with a history of the cases, and also with some of the suspected oats. To this I received the subjoined reply—

5, Woodhouse Lane, Leeds;
Sept. 2, 1861.

My Dear Sir,—I hope to send you the particulars of the cases referred to in my last, by to-morrow's post. I have also directed that some of the oats be sent, and they will leave here, per Great Northern Railway, to-morrow.

I am, sir, &c.,
(Signed) JOHN MITCHELL.

Two bushels of the oats duly arrived, and also a detailed account of the cases to the following effect—

July 22.—This afternoon Mr. Dray, M.R.C.V.S., of this town, was requested to attend a gray pony, at the stables of Mr. Wm. Ingham, tanner, Armley, near Leeds. On his arrival, he found the pony down and unable to rise, and evidently "in *articulo mortis;*" in fact, the animal died soon afterwards. The only symptoms observed by those who saw the pony previous to Mr. Dray, were a staggering gait, and laboured respiration. Mr. Dray from noticing a very blanched condition of the mucous membranes, concluded that death was probably caused from internal hæmorrhage, and he made no post-mortem examination.

July 24.—On the groom visiting the stable, at three o'clock this morning, he was surprised to find a valuable thorough-bred hunter (which to all appearance was in perfect health on the previous night), down, and unable to rise. Mr. Dray was immediately sent for, and attended forthwith. He observed the following symptoms:—The horse still down. Pulse, 58, and full; mucous membranes slightly injected, and breathing laborious. The muscles also of the loins and hinder extremities were partially paralyzed, and the tongue was hanging from the mouth. The groom accompanied Mr. Dray to his residence, for some medicine, but on his return to the stable, as the horse was evidently dying, the medicine was administered. He died at eight o'clock, a.m.

At two p.m., this same day, a brown mare, which the groom had ridden when going for Mr. Dray, and which was ridden by that gentleman to Armley, and remarked upon by him as being fresh and eager for going, was found down in her box. Mr. Ingham immediately started for Mr. Dray, but as he was from home, Mr. Cuthbert, and myself, were desired to attend. We arrived at three p.m., and found the mare standing; pulse 55, and full; conjunctival and Schneiderian membranes slightly injected: respiration laboured, and extremities warm. In fact, there was nothing to lead us to suppose that she was in danger. Some oleaginous-purgative medicine, which had been intended for the thorough-bred horse had already been given, and some further medicine was ordered by us. We then left her to make a post-mortem examination of the horse, the abdomen of which had already been opened, and the intestines removed. The external appearances presented were quite in accordance with perfect health; but on cutting open the stomach, the villous portion of the mucous membrane was found to be highly inflamed, and easily removeable from its attachment to the muscular coat. On opening the small intestines, the lining membrane was found still further inflamed, and in some places seemingly to be entirely gone. The liver and lungs were much congested. The stomach and intestines of the gray pony, which were in the course of being buried, were next exhumed, and presented exactly similar appearances.

Our attention was now directed to the food, and which we found to consist principally of oats, that had been in stock for some weeks, and upon which the animals had been regularly fed up to this date. Some bean-meal and bran also, both of which had been purchased on the day before the pony died, had been used for the first time on the evening previous.

The oats, which were foreign ones, consisted originally of twelve quarters of which about five quarters now remained; and with the exception of having a fusty smell, they presented nothing remarkable, nor did the bean-meal or bran, both of which had been purchased from a respectable dealer, and were unexceptionable in quality. It was deemed imperative, however, that no more of either should be used until an analysis had been made by a competent chemist.

I will now return to the case of the brown mare. She was seen by Mr. Dray and myself at 8 p.m., and appeared in much the same condition as at 3 p.m. We exhibited some medicine, and left more to be given every four hours. An injection was also thrown up, and orders given to repeat it, if necessary, during the night. The mare *was seen to drop* at 2 on the following morning, and died at 11; and when examined *post-mortem*, the condition of the stomach and small intestines was found to be precisely similar to the others.

A gray draught-gelding, out at grass, was at 6 on the morning of the 31st found down in the field and unable to rise. This horse had some of the oats on the 24th, and was noticed on the 25th not to be so well as usual. He however appeared to recover shortly afterwards, and no further notice was taken of him until he was found down.

I saw him at noon, and as he was then evidently past recovery, no medicine was given. At Mr. Ingham's request he was destroyed. *Post-mortem* similar to the others.

An aged black draught mare, emaciated but still in good health, was this afternoon obtained for the purpose of experiment, and placed in the same box which the other animals had died in. She had a feed of the oats on her arrival, and was regularly fed till the evening of the 2nd of August. On the 3rd of August, at 6 a.m., she was found down and unable to rise. She had eaten her evening feed, and died at 11 a.m. *Post-mortem* as the others.

Another mare was now purchased and placed in the same box, but fed upon food obtained from a different source. She remained a week, and as she was then in good health she was removed.

On the afternoon of Saturday, the 17th of August, a dun pony fourteen hands one inch high, was placed in a stable several hundred yards from Mr. Ingham's, and fed upon the suspected oats. He had one feed in the evening, one on Sunday morning, and a third in the evening of that day, with the addition of a small handful of hay. He was found *dead* at 7 o'clock on the Monday morning, having eaten only part of his food. The corn remaining in the manger was completely saturated with saliva, the quantity of which Mr. Ingham estimated at between three and four pints. The *post-mortem* like the other.

The stomach and intestines, with their contents, and also a portion of the liver of the bay horse, brown mare, and gray horse, were given over for analysis to two different chemists, but nothing has been found to assist in a solution of the mystery. The oats, bean-meal, and bran, have also been analyzed, but without any poisonous matter being found.

Some of the oats have been sent, per Great Northern Railway, directed to you to-day, and I hope you will give them to an animal; if so, I have no doubt they will produce death. I think the matter should be laid before the profession, and I shall be glad if you will take steps to have the published. Should you wish for further information, I will endeavo obtain it.

I am, my dear Sir,
Yours very truly,
(Signed) JOHN MITCHELL.

To George Varnell, Esq.,
Royal Vet. College.

On the 10th September, 1861, a brown mare was procured by the College for the purpose of being fed upon the suspected oats. She was old, but apparently in a healthy condition. She was placed in a loose box, and on the first day had only one feed of the oats given her. On the 11th, she had four feeds, and the same quantity on the 12th. On the 13th, however, she had only three feeds, for during the afternoon of this day, she was observed to have a staggering gait, and at six in the evening, she fell, and was unable to get up again Her hind extremities were nearly paralysed. Sensation was so benumbed, that she scarcely responded to the prick of a pin. The visible mucous membranes were pale, the pupils dilated, breathing increased, apparently chiefly from the position in which she laid. The pulse numbered about fifty, and was very feeble, and her tongue protruded from her mouth. She did not appear to suffer much pain. She lingered on until the 15th, when she died, and immediately after death, an examination of the body was made.

The stomach and intestines were found to be pale in colour and very flaccid. The liver was small, and also paler than natural; spleen very small; the mucous membrane of the stomach and intestines likewise, much lighter in colour than natural. On the surface of the lungs there were marks of long standing disease, but these could not have had anything to do in causing the death of the mare, and which I had no doubt whatever was caused by her eating the oats with which she had been supplied.

In reflecting on the above facts, it is difficult to come to any other conclusion, than, that the death of all the horses, including the mare experimented upon at the College, was caused by eating the oats in question, although we may not be in a position to state, with any degree of precision, the nature of the poison they contained, or even whether it were mineral or vegetable. The oats, it is true, had been analysed by three competent chemists, two of them residing in Leeds, and a third in London, viz., Professor Tuson, Lecturer on Chemistry at the Royal Veterinary College. None of these gentlemen detected any mineral poison, and as the symptoms evidenced by the animals, as also the post-mortem appearances were such, as not to lead to the idea that agents of this class had been partaken of, I think a very strong inference may be drawn, that the death of the horses was not so caused.

The next question which naturally suggests itself, is, what could there be in the oats themselves, or diffused among them, to have been so injurious to animal life? Again, it may be observed, that none of the chemists mentions his having detected any *vegetable* poison, such as we can conceive would have been *mixed* with the oats to an extent sufficient to have caused the death of animals. And as we have no positive evidence that such a wicked proceedure had been resorted to by any one, we must, I think, on the score of charity, conclude that no one had been base enough to attempt such an act. If then we are to discard the idea that the animals were not destroyed by either of the above means, *that is*, by no poison—mineral or vegetable—the question arises:—What is the most probable cause of death? Is there anything peculiar belonging to the oats, independent of what could have been added to them, which would be likely to affect the health of animals fed upon them? This is a question which I think should be left open; and that we ought simply to record what we have noticed, leaving for future observation and investigation to either negative or confirm our surmises.

It may be asked in the *first* place whether anything has been found in the oats to raise a suspicion that they are not healthy food, and *secondly*, if so, do the symptoms wholly or in part, agree with those we should expect would be developed in horses which had been fed upon them? On the arrival of the oats at the College, I at once, as a matter of course, looked at them, and my first impression was, that they were a very bad sample of feeding corn. They were damp, dark in colour, and had a very musty smell.

I was now led to investigate them more closely, and I found that many were matted together into lumps by a thready, cobweb-like kind of material. The majority of them were covered with a smutty substance, and the interior of a considerable number was decayed, so that, instead of the natural white flower of the oat, this was filled with granular matter having a blackish-gray hue, and which in many instances projected some distance above the surface of the oat. This slight investigation induced me to carry the examination still further, and for this purpose I sought the aid of the microscope, by which I was enabled to discover, that the thready material consisted of elongated cells; that the surface of the oats was covered more or less, with well-defined bodies, which were also observed, but in fewer numbers, to be connected with the thready material, and that the dark-gray matter found in their interior was granular, the granules being supported by a reticular-like substance.

During this brief examination, an idea arose in my mind that I was looking at some parasitic fungi, and which were, perhaps, poisonous, and I thought it even probable that the death of the horses might have been caused by these parasitic bodies. This determined me to have recourse to the experiment of feeding a horse upon them, and for this purpose, as previously stated, an old but healthy mare was purchased. The result I have before described, and which we see so closely agrees with the experiments carried out at Leeds, that I did not deem it necessary to procure another subject for the purpose. To still further carry out, however, the investigation, portions of the oats were handed to Professor Tuson for his examination, the result of which he has kindly placed in my hands, illustrated with several beautiful engravings by his brother, Mr. H. B. Tuson, and to which I would now especially refer the reader.

PROFESSOR TUSON'S REPORT ON THE CHEMICAL AND MICROSCOPICAL EXAMINATION OF SOME OATS SUPPOSED TO POSSESS POISONOUS QUALITIES.

The following report embodies the results of the chemical and microscopical examination of some oats that were supposed to have caused the death of several horses that had partaken of them as food.

My first object was to prove the presence or absence of mineral poisons, but chemical analysis failed to detect any deleterious matter whatever.

The structure and general physical characters of the oats were then carefully studied and compared with those possessed by oats of good quality.

General characters of the Oats.

The oats had what is commonly known as a musty odour. When examined by the naked eye, they were found to be coated more or less completely by a grayish pulverulent matter which could be easily detached, and by minute specs having a drab colour, and sometimes a silvery white appearance.

By referring to B, Fig. I, one can observe the appearance presented by many of the oats. On the left side of this drawing is represented the grayish deposit in great quantity.

It there appears to be convoluted or folded. On making longitudinal sections of some of these oats, the white farinaceous matter contained in oats of good quality was sometimes partially and sometimes completely replaced by a dark-coloured, hard, horny mass. C, Fig. I, represents a vertical section of an oat of this description, in which the horn-like body has been partially developed. A, Fig. I, is a section of a healthy oat, and is placed by the side of C for the sake of comparison.

Fig. I.

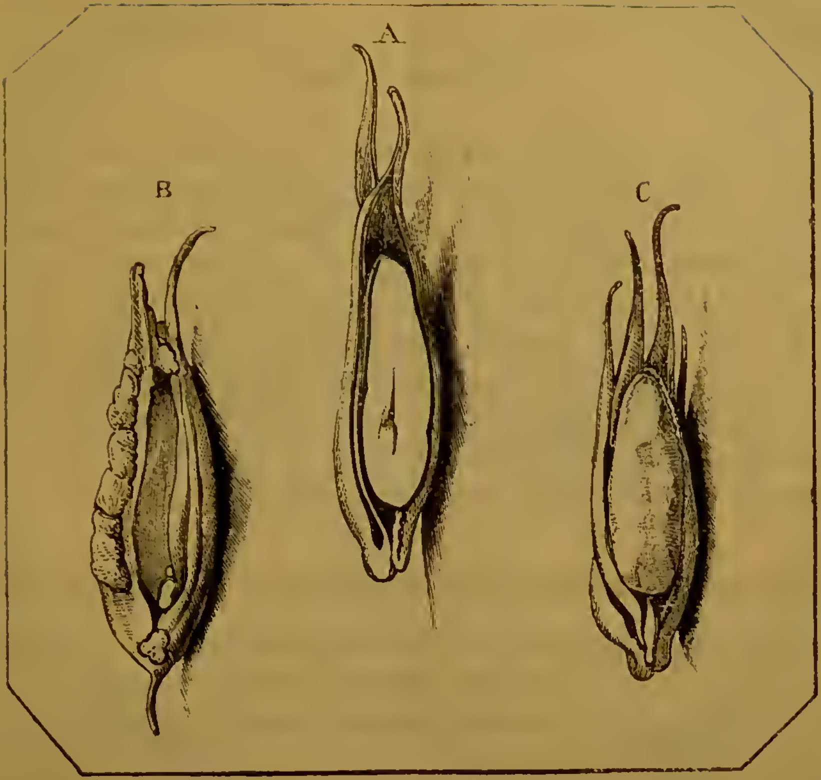
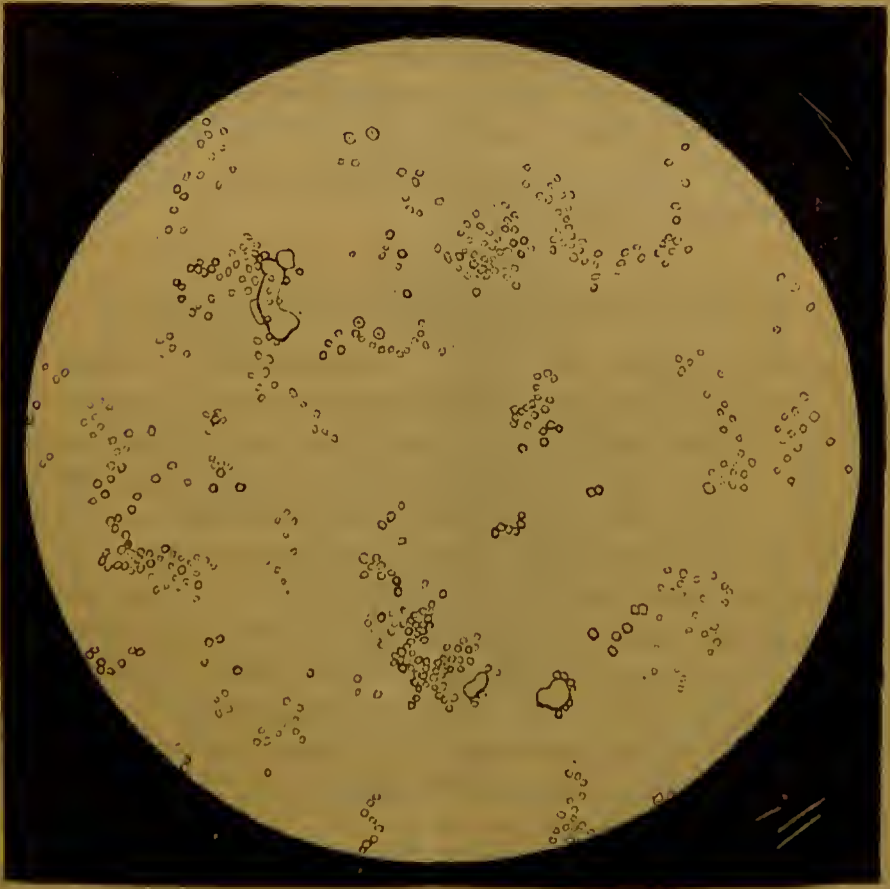


Fig. II.



Microscopic examination of the gray pulverulent deposit and of the horny mass.

When microscopically examined by a quarter-inch object-glass, the gray pulverulent deposit upon the exterior of the oats, as well as the horny mass contained in them, presented the appearance indicated in Fig. II. These small circular bodies are the spores or germs of minute fungi. By instituting a more rigid search, the objects shown in Fig. III were discovered. They appear to consist of long tubes terminating in a congeries of minute globular bodies. These are the mycelium or roots of fungi belonging to the *mucor* or common mould class.

Microscopic examination of the surface of an entire Oat.

For this purpose it was found desirable to employ reflected light, and to use an object-glass, having a half inch focal power. A, Fig. IV, represents the surface of an oat upon which is standing and apparently out of which is growing a fully developed fungus of the most beautiful description. The head of this little fungus evidently resembles that of the common mushroom in its general appearance. It belongs to a species of *aspersgillus.* In the other parts of the same drawing we may easily detect some of the spores depicted in Fig. II, the mycelium or roots shown in Fig. III, and a number of the mushroom-like fungi (*aspersgill*) referred to in the preceding paragraph.

Results of experiments made with the Oats.

A quantity of the oats under examination, and an equal quantity of oats of good quality were placed side by side, moistened occasionally, and kept at a temperature of 80° Fahr. After three or four days, both kinds began to germinate. As the germination proceeded, an immense quantity of fibrous vegetable matter formed upon the bad oats, causing them to mat firmly together so that one could lift them up *en masse,* and it required the application of a considerable amount of force to tear them asunder. The good oats, although they had been exposed to the same influences as the bad ones, and although they had undergone germination, were entirely free from the fibrous vegetable development just alluded to.

In another experiment, some of the oats were mixed with

Fig. III.

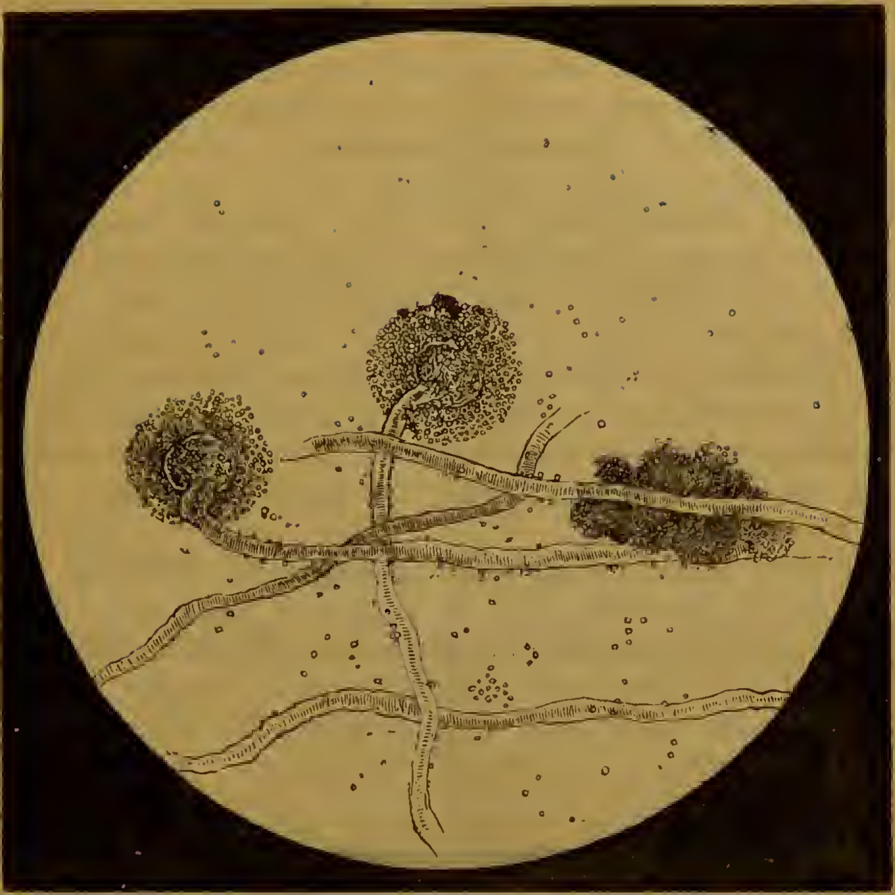
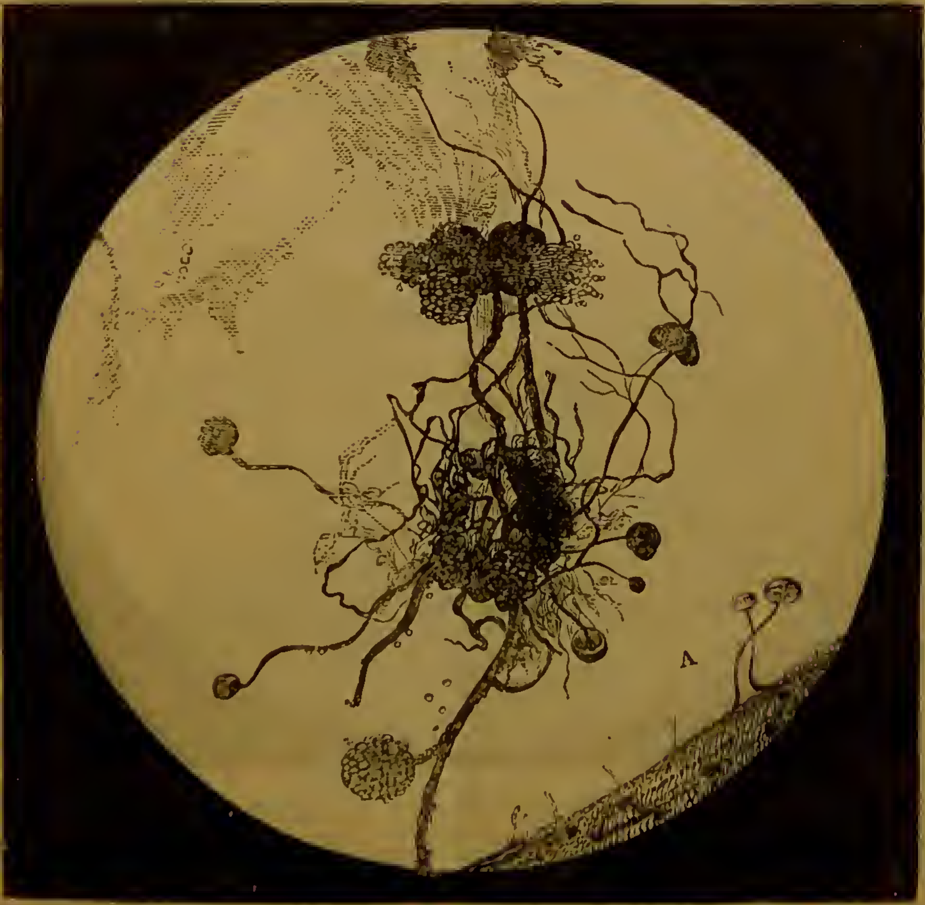


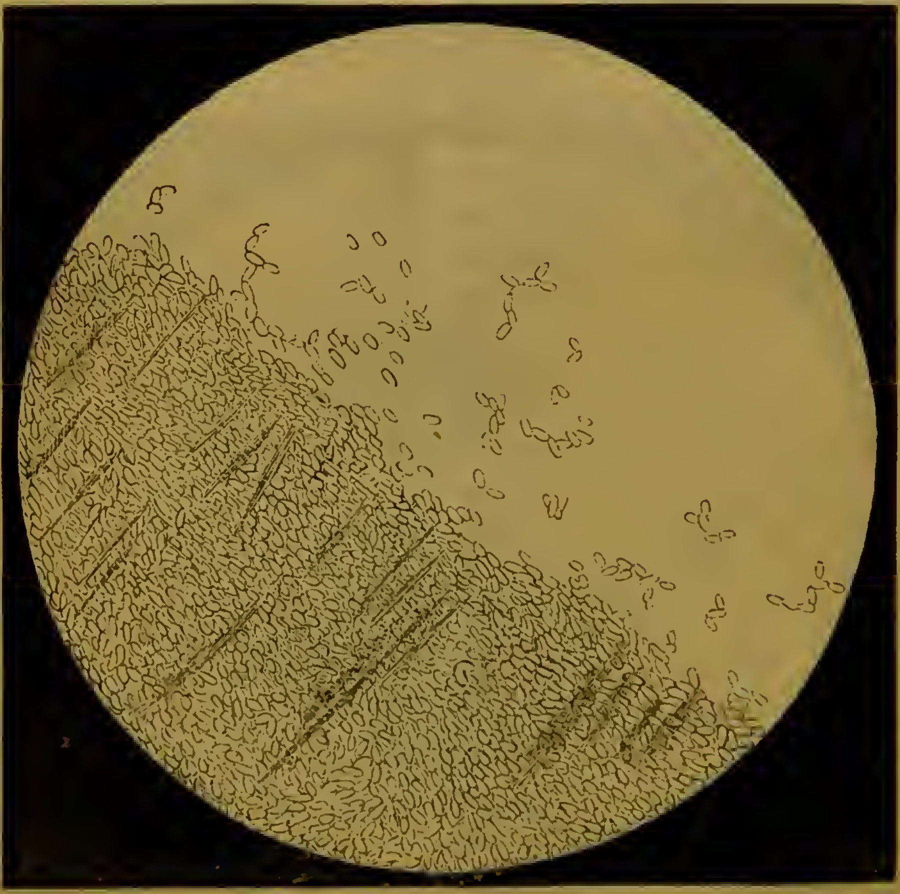
Fig. IV.



distilled water, well shaken, and strained through calico. The strained liquid was afterwards passed through paper. By this means we obtained a brownish mud-like substance which remained upon the filter, and a clear transparent fluid which passed through the filter. On allowing the precipitate to remain in the laboratory at a temperature between 60° and 70° Fahr., it soon assumed a mould-like appearance superficially. This mould-like substance when magnified, exhibited a vegetable filamentous structure, the filaments interlacing one another in a most beautiful manner, and similar to, if not identical with the substance produced during the germination of the bad oats, and which caused them to mat together.

The clear liquid which passed through the filtering paper, after standing for a few days, developed a large quantity of a grayish insoluble substance, a portion of which fell to the bottom of the vessel, and another portion floated upon the surface of the fluid, and exhibited to the naked eye very marked "mouldy" or fungoid characters. Fig. V shows the microscopic appearance of the fungoid matter produced upon the surface of the fluid. Its structure, as well as its

Fig. V.



Mushrooms, puffballs,* toad-stools &* are fungi: so are the blue moulds on paste, cheese & jams; whilst brewer's yeast presents us with one of the tribe in its simplest & earliest form of growth —

~~When~~ The epiphyllous fungi attack plants ~~[illegible]~~ they appear to set up some sort of irritation which produces at length ill health & disease & death. during winter this class entirely disappear showing how much a frosty day are will do in getting rid of them.

Evergreens are remarkably free from the attacks of fungi. this may be due to the density of their cuticle, as well as the aroma dis- juices it contains in some —

Sphaeria ascigerous fungi with corneous envelopes: Peziza naked ascigerous fungi in a particular variety of operculate type.

found on bread, also in the inside of casks; and there is reason to believe its spores poisonous, for two coopers who entered a great tun, covered with this mould, to clean it, inhaled them, and were seized with violent pains in the head, giddiness, and vomiting, which only yielded to severe medical treatment."

Considerations suggested by the foregoing facts and observations.

1st. No mineral poison was discovered in the oats by chemical analysis.

2nd. The oats were extensively contaminated by a mould-like fungus.

3rd. It is known, on good authority, that many mould-like fungi are poisonous to animals.

4th. The infected oats were given by Professor Varnell and others to several horses, and the animals subsequently died.

Now, without stating positively that the infected oats poisoned the animals that eat them, I think we may safely infer from the facts referred to in this report alone, that in all probability they were the cause of their death.

Since writing the above I have had an opportunity of showing the drawings of the fungi to Mr. Jabez Hogg, whose intimate acquaintance with microscopic subjects is well known. Mr. Hogg at once identified the fungi, portrayed in Fig. IV as a variety of *aspersgillus*.

It will also be interesting and satisfactory to state, that this gentleman had no hesitation in saying that the horses were killed by the fungus attacking the oats; for he knew of many instances in which sickness and death had been occasioned in various animals by the very same species.

With this report before us we may now inquire how far the symptoms, observed in these cases, agree with those of poisoning by vegetable fungi, as noticed in the human subject; for we have no veterinary data which can assist us in coming to a right conclusion on such a point. On referring to Taylor, 'On Poisons,' p. 768, I find that the following symptoms—produced in the human subject from partaking of poisonous fungi—are the most prominent; viz., giddiness, dimness of sight, debility, stupor, and injection of the visible mucous membrane, the stupor being in many instances followed by irritation of the intestinal canal and with vomiting and purging.

Other authors mention the presence of such symptoms as fainting, loss of motor power, small, feeble pulse, cold sweats, dilated pupils, loss of sight, and death.

It will be seen, on referring to the description of the symptoms, as given by Mr. Mitchel, that the gray pony, when first taken ill, was found to have a staggering gait, and that when down he was unable to rise, also, that his breathing was laboured, and the visible mucous membrane blanched.

The next case—a thorough-bred hunter—was found down, and quite unable to rise, in consequence of his hind extremities being partially paralysed. His pulse numbered 58 per minute; his tongue hung partially out of his mouth, and the mucous membranes were slightly injected.

In the third case—a brown mare—the pulse was 55, and mucous membrane also injected; but no other symptoms are described.

The fourth case—a gray cart-horse—was found down, and unable to rise.

Then comes an experimental case. A black cart-mare had some of the oats given her, and on the day following she was found down, and unable to rise.

The next was also an experimental case. A pony, which likewise died on the second day, after having partaken of the oats. Some of his symptoms are recorded; and the manger from which he had eaten his food was found to contain from three to four pints of saliva.

With regard to the brown mare which was fed with some of the oats at the College, it will be seen that, after partaking of them for three days, she also was found to have a staggering gait, feeble pulse, pale mucous membranes, and dilated pupils. Besides these symptoms, her tongue partially protruded from her mouth which was accompanied with a dribbling of saliva; and when down she also could not get up again, in consequence of her hind extremities being paralysed.

It will thus be observed that in all the cases, loss of power, especially of the hind extremities, was present, except in one, and in this case the symptoms are not recorded. In all, also, the symptoms, judging by analogy, are characteristic of poisoning by narcotico-irritant poisons.

With regard to the post-mortem appearances, they are not so conclusive. In some instances the irritating action of the agent which had caused the death had shown its influence by an increased redness of the mucous membrane of the stomach and intestines; while, in other cases, this condition of the membrane was not observed. In the brown mare, for example, which died at the College, the whole of this mucous track was pale and flabby.

From the foregoing statement, the evidence is strongly in favour of death having been caused by poisonous fungi, in, upon, and among the oats which the animals had partaken of, but still we are not in a position to assert positively that such was the case. We have seen that no injurious effects were observed until nearly half the quantity bought by Mr. Ingham was consumed, and we may not unreasonably suppose that the twelve quarters were not the whole of the oats of that peculiar quality which the cornfactor had originally purchased, but that others, from the same lot, were sold by him to different horse proprietors, and, for ought we know, their horses received no injury by eating them.

This being the case, we can only suppose that the oats, which were originally of inferior quality, were placed in a narrow and deep bin, and that while there they underwent a change favorable to the development of poisonous fungi, which we have clearly shown existed to a very great extent. This change probably took place in the centre of the bulk, as can be readily imagined, and as such it will account for the horses not being affected until that portion was arrived at. If this be not the true explanation, then the only other way we can account for the deleterious character of the oats, would be by supposing that some poisonous agents had been mixed with them at this stage of their consumption, and which has altogether escaped the search of the chemist.

The above cases are highly interesting in several points of view. They will doubtless excite in the minds of many practitioners, when searching for the cause of disease, or even death, that other objects must be investigated beyond those they have been in the habit of looking for.